CLAIMS

We claim:

1. A device for removing contaminants from a natural gas stream, the device comprising:

first adsorbent means positioned within a first fluidized bed operating at a first predetermined temperature for removing at least a portion of the contaminants from the natural gas stream and creating a partially sweetened natural gas stream; and

second adsorbent means positioned within a second fluidized bed operating at a second predetermined temperature for receiving the partially sweetened natural gas stream, the second adsorbent means removing at least a portion of the contaminants from the partially sweetened natural gas stream.

2. The device of claim 1 wherein the contaminants are selected from the group consisting of H_2S, CO_2, and H_2O.

3. The device of claim 1 wherein the first adsorbent means is a molecular sieve.

4. The device of claim 1 wherein the second adsorbent means is a molecular sieve.

5. The device of claim 1 wherein the first predetermined temperature is greater than the second predetermined temperature.

6. The device of claim 1 wherein the first predetermined temperature is between approximately twenty (20°) degrees C and approximately sixty (60°) degrees C.

7. The device of claim 6 wherein the first predetermined temperature is approximately twenty-five (25°) degrees C.

8. The device of claim 1 wherein the second predetermined temperature is between approximately one hundred (100°) degrees C and approximately three hundred (300°) degrees C.

9. The device of claim 2 wherein the second predetermined temperature is approximately two hundred (200°) degrees C.

10. The device of claim 1 and further comprising:

conversion means for converting H_2S within the removed contaminants to elemental sulfur and hydrogen at a predetermined temperature less than approximately four hundred (400°) degrees C.

11. The device of claim 10 wherein the conversion means is a nonthermal plasma corona reactor.

12. An apparatus for converting H_2S to elemental sulfur and hydrogen, the apparatus comprising:

conversion means for receiving H_2S and for converting H_2S to elemental sulfur and hydrogen at a predetermined temperature less than approximately four hundred (400°) degrees C.

13. The apparatus of claim 12 wherein the conversion means is a nonthermal plasma corona reactor.

14. The apparatus of claim 12 and further comprising:

adsorbent means positioned within a fluidized bed for removing at least a portion of H_2S from a natural gas stream; and

means for providing the removed H_2S to the conversion means.

15. The apparatus of claim 14 wherein the adsorbent means includes a first adsorbent having a first predetermined temperature and second adsorbent having a second predetermined temperature.

16. The apparatus of claim 15 wherein the first adsorbent means and the second adsorbent means are a molecular sieves.

17. The apparatus of claim 15 wherein the first predetermined temperature is

greater than the second predetermined temperature.

18. A method for removing H_2S and other contaminants from a natural gas stream and converting H_2S to elemental sulfur and hydrogen, the method comprising:

providing first adsorbent means;

positioning the first adsorbent means within a fluidized bed at a first predetermined temperature;

introducing the natural gas stream to the first adsorbent means thereby removing at least a portion of the H_2S and other contaminants from the natural gas stream and creating a partially sweetened natural gas stream;

providing second adsorbent means;

positioning the second adsorbent means within a fluidized bed at a second predetermined temperature;

introducing the partially sweetened natural gas stream to the second adsorbent means thereby removing at least a portion of the contaminants from the partially sweetened natural gas stream;

providing a nonthermal plasma reactor;

introducing the removed contaminants to the nonthermal plasma reactor; and

converting the H_2S to elemental sulfur and hydrogen at a third predetermined temperature.

19. The method of claim 18 wherein the first adsorbent means and the second absorbent means are molecular sieves.

20. The method of claim 18 wherein the first predetermined temperature being greater than the second predetermined temperature.

21. The method of claim 18 wherein the first predetermined temperature being between approximately twenty (20°) degrees C and approximately sixty (60°) degrees C.

22. The method of claim 18 wherein the second predetermined temperature being between approximately one hundred (100°) degrees C and approximately three hundred (300°) degrees C.

23. The method of claim 18 wherein the third predetermined temperature being less than approximately four hundred (400°) degrees C.